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# The Science of Computing and the Engineering of Software

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Science  $\longleftrightarrow$  Engineering

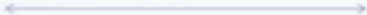
- pure scientist

engineering scientist

.....

scientific engineer

practicing engineer

Science  Engineering

- long-term

- short-term

# Science Engineering

- long-term
- idealism

- short-term
- compromise

# Science Engineering

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• long-term</li><li>• idealism</li><li>• certainty</li></ul> | <ul style="list-style-type: none"><li>• short-term</li><li>• compromise</li><li>• risk management</li></ul> |
|--|---|

# Science Engineering

- long-term
- idealism
- certainty
- perfection

- short-term
- compromise
- risk management
- adequacy

# Science Engineering

- long-term
- idealism
- certainty
- perfection
- generality

- short-term
- compromise
- risk management
- adequacy
- specificity



# Science Engineering

- long-term
- idealism
- certainty
- perfection
- generality
- separation

- short-term
- compromise
- risk management
- adequacy
- specificity
- integration

# Science Engineering

- |               |                   |
|---------------|-------------------|
| • long-term   | • short-term      |
| • idealism    | • compromise      |
| • certainty   | • risk management |
| • perfection  | • adequacy        |
| • generality  | • specificity     |
| • separation  | • integration     |
| • originality | • best practice   |

# Science Engineering

- long-term
- idealism
- certainty
- perfection
- generality
- separation
- originality
- formality

- short-term
- compromise
- risk management
- adequacy
- specificity
- integration
- best practice
- intuition

# Science Engineering

- long-term
- idealism
- certainty
- perfection
- generality
- separation
- originality
- formality
- correctness

- short-term
- compromise
- risk
- adequacy
- specificity
- integration
- best practice
- intuition
- dependability

# The Science of Computing

- seeks answers to basic questions
  - what does a program do?
  - how does it work?
  - why does it work?
  - how do we know?

# The Science of Computing

- seeks answers to basic questions
  - what does a program do?  
described by its specification
  - how does it work?  
by split into modules with defined interfaces
  - why does it work?  
by theory of program semantics
  - how do we know?

# Science delivers results

- as a software engineering toolset  
covering all phases of software development
  - specification, design, coding, testing,  
modification, evolution, ...integrating the services of
  - program analysers, type checkers, theorem  
provers, code generators, test case generators, ...

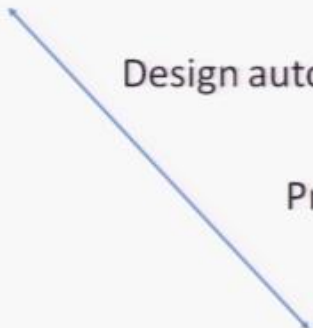
# Technology transfer

Science of correctness

Design automation

Program analysis

Engineering of dependability





## One day ...

- Software will be the most reliable component of every product which contains it.
- Software engineering will be the most dependable of all engineering professions.
- Because of the successful interplay of research
  - into the science of programming
  - and the engineering of software